The coroner arrived at midnight and found the victim's body temperature was 56.49°F. Three hours later, the temperature was 37.20°F.

(a) If the body temperature decreases exponentially, write a function for the body temperature with respect to time. Round to 3 decimal places.

$(0, 56.49)$ $(3, 37.2)$

① $56.49 = ab^0$

$a = \frac{56.49}{b^0}$

$a = 56.49$

② $37.2 = 56.49(b)^3$

$b^3 = \frac{37.2}{56.49}$

$b = \sqrt[3]{\frac{37.2}{56.49}} \approx 0.87$

③ $y = 56.49(0.87)^x$

(b) Approximately what time did the victim die? (I.e. what time was the body temperature 98.6°F?)

$\frac{98.6}{56.49} = \frac{56.49(0.87)^x}{56.49}$

$1.745 = 0.87^x$

$x = \frac{\log 1.745}{\log 0.87} \approx -4$

① Solve for x

$5^x = 280$

ⓐ $8^x = 50$ $x = 1.881$ $\frac{\log 50}{\log 8}$

ⓑ $\log_5 280 = x$ $x = 3.501$

ⓒ $\ln 150 = x$ $x = 5.011$

ⓓ $\log_x 343 = 3$ $x^3 = 343$ $x = 7$

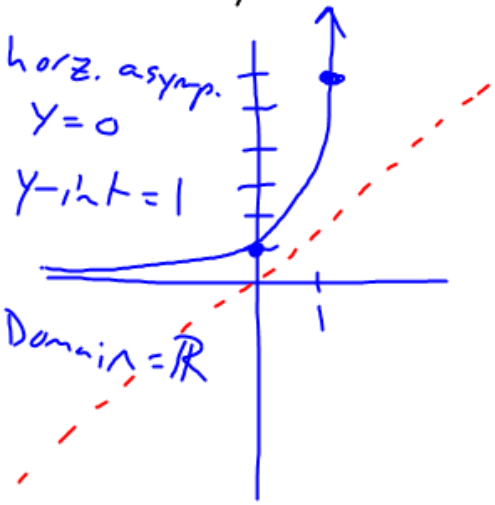
ⓔ $e^x = 217$ $\frac{\log 217}{\log e}$ $x = 5.379$ $\ln 217$

ⓕ $8(1+0.05)^x = 24$ 22.517

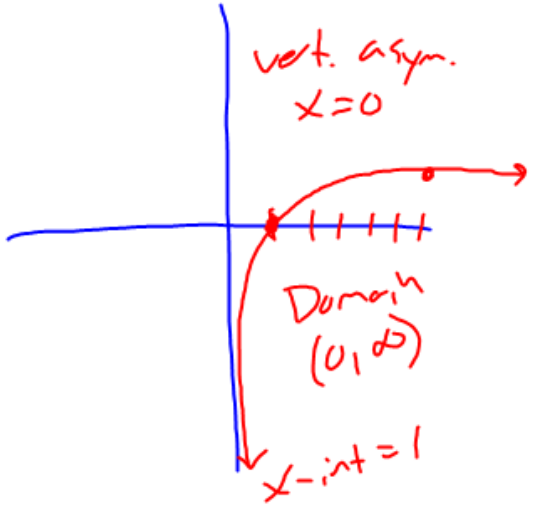
$(1+0.05)^x = 3$ $\frac{\log(3)}{\log(1+0.05)}$

② Graph by hand and find domain, intersects, and asymptotes

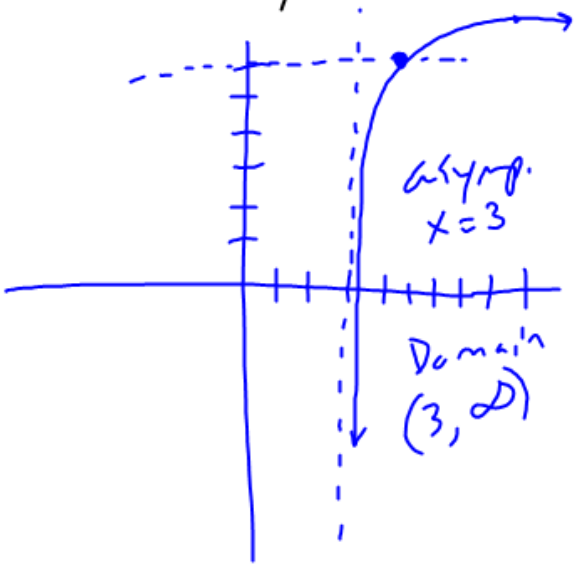
ⓐ $y = 6^x$



ⓑ $y = \log_6 x$

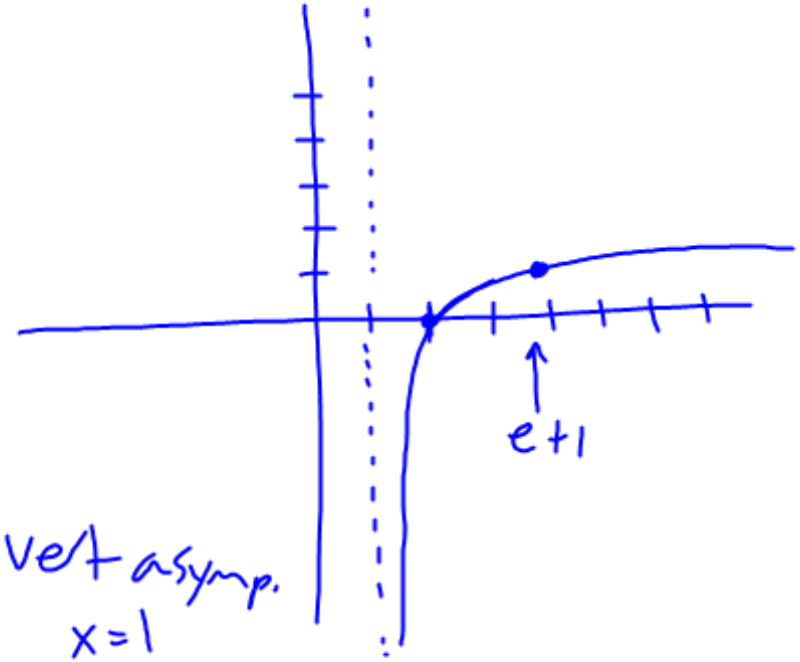


ⓒ $6 + \log_6(x-3)$



(61)

$f(x) = \ln(x-1)$



vert asymp.
$x = 1$

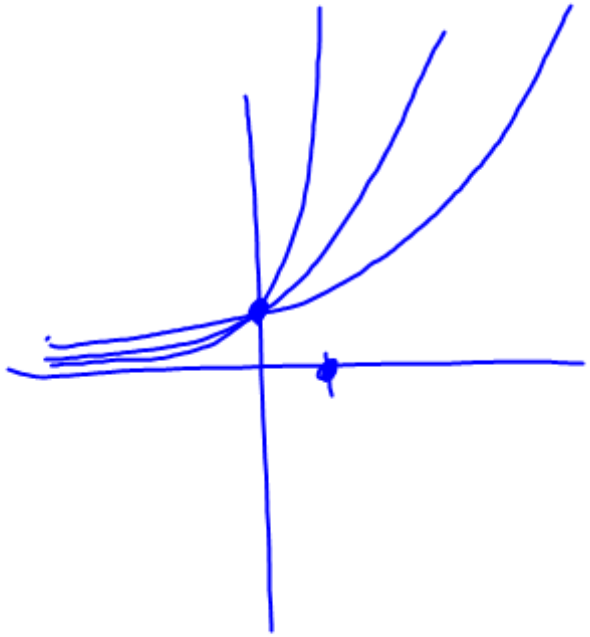
Domain
$(1, \infty)$

x-int $= 2$

$\ln(e+1-1)$

$\ln e^x = x$

$\ln e^1 = 1$



Properties of Exponents

1. $a^m \cdot a^n = a^{m+n}$

2. $\frac{a^m}{a^n} = a^{m-n}$

3. $(a^m)^n = a^{mn}$

4. $a^{m/n} = \sqrt[n]{a^m}$ or $(\sqrt[n]{a})^m$

5. $a^0 = 1$

6. $a^{-n} = \frac{1}{a^n}$

7. $\left(\frac{a}{b}\right)^{-n} = \frac{b^n}{a^n}$

8. $(ab)^n = a^n b^n$

Properties of Logs - Basic

① $\log_a 1 = 0$ b/c $a^0 = 1$

② $\log_a a = 1$ b/c $a^1 = a$

③ $\log_a a^x = x$ and $a^{\log_a x} = x$ inverse property

④ If $\log_a x = \log_a y$ Then $x = y$ one-to-one property

like

$(\sqrt{x})^2 = x$

$\sqrt{x^2} = x$

* All properties also hold with the natural log

Do these Problems and pay attention

① $\log 2 + \log 5 = 1 = \log(10)$

② $\log 2 + \log 50 = 2 = \log(100)$

③ $\log 20 + \log 50 = 3 \quad \log(1000)$

④ $\log(150) = 2.17$

⑤ No Calc, what is $\log 3 + \log 50$? $= \log 150 = 2.176$

Cont.

① $\log 50 - \log 5 = 1 = \log(10)$

② $\log 3000 - \log 3 = 3 = \log(1000)$

③ $\log 150 - \log 1.5 = 2 \quad \log(100)$

④ $\log(150) = 2.176$

⑤ No Calc, what is $\log 450 - \log 3$? 2.176

cont.

① Compare $\log_2 100$ and $\log_6 100^3$ 3 times bigger

② Compare $\log_3 1000$ and $\log_{12} 1000^4$ 4 times

③ Compare $\log 2$ and $\log 2^3$ 3 times

④ $\log(1.78) = 0.25$

⑤ No Calc, find $\log 1.78^3$ 0.75

Properties of Logarithms

① $\log_a x + \log_a y = \log_a(xy)$ $\qquad \ln x + \ln y = \ln(xy)$

② $\log_a x - \log_a y = \log_a\left(\frac{x}{y}\right)$ $\qquad \ln x - \ln y = \ln\left(\frac{x}{y}\right)$

③ $\log_a x^n = n \cdot \log_a x$ $\qquad \ln x^n = n \ln x$

Use the properties of logarithms to expand

(a) $\log_4 5x^3y$

$\log_4 5 + \log_4 x^3 + \log_4 y$

$\downarrow$

$\log_4 5 + 3\log_4 x + \log_4 y$

(b) $\ln\left(\frac{\sqrt{3x-5}}{7}\right) = \ln\frac{(3x-5)^{\frac{1}{2}}}{7}$

$\ln(3x-5)^{\frac{1}{2}} - \ln 7$

$\frac{1}{2}\ln(3x-5) - \ln 7$

ex 5

Use the properties of logarithms to condense

(a) $\frac{1}{2}\log_8 x + 3\log_8(x+1)$

$\log_8\left(x^{\frac{1}{2}} \cdot (x+1)^3\right)$

(b) $2\ln(x+2) - \ln x$

$\ln \frac{(x+2)^2}{x}$

ex. 6

HW! Sect. 3.3 #9-16(4), 19, 20, 23-42(2 easy, 2 hard),

45-62(2 easy, 2 hard), 67, 71, 77